

Flood Inundation Mapping: Communicating Flood Risk to Communities at Streamgages

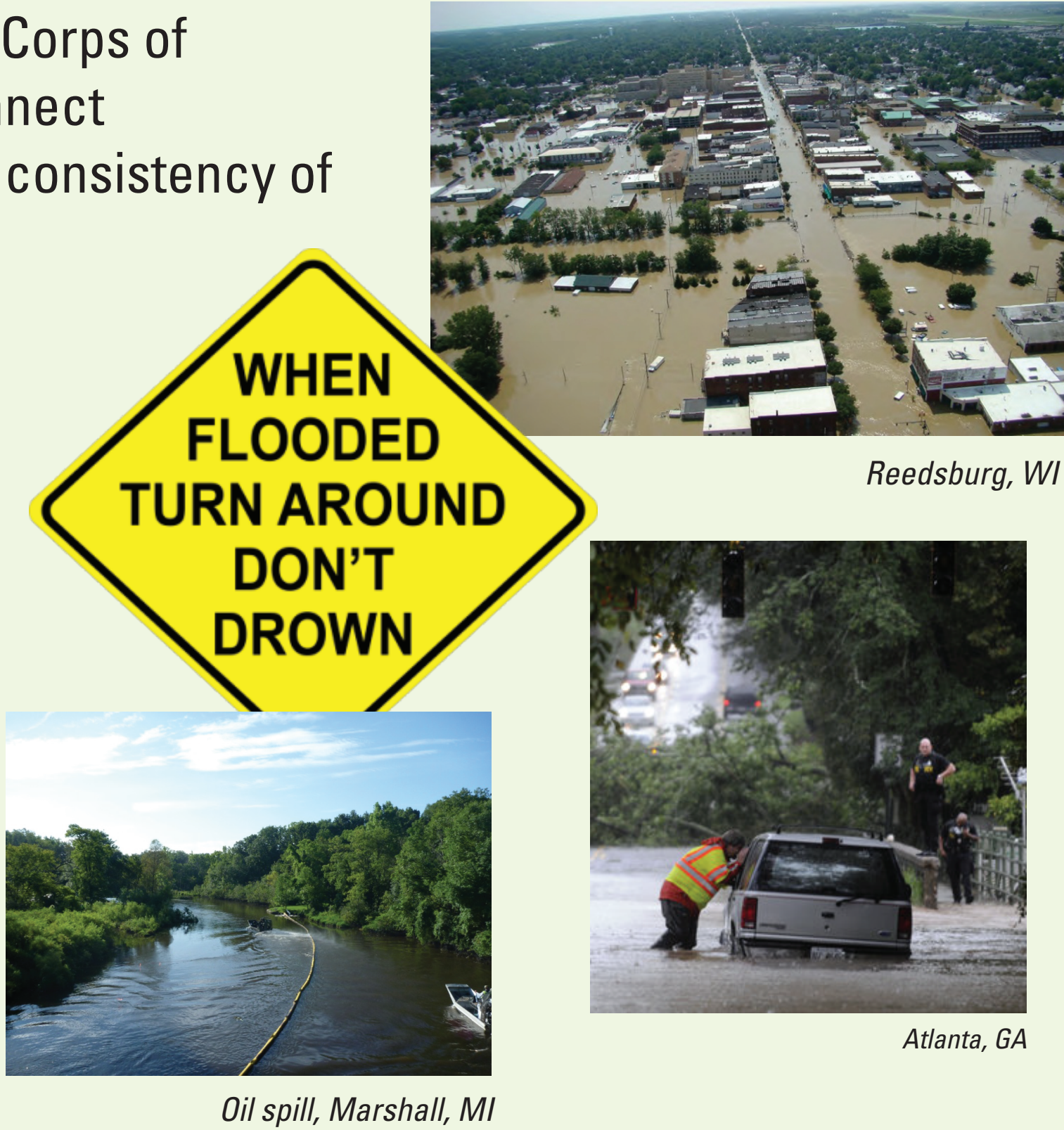
Local solutions for flood risk communication

The USGS Flood Inundation Mapping Program focuses on expanding the USGS Streamgage Network flow data out across the landscape away from the gage. The efforts at state and local levels to help communities understand flood risks and make cost-effective mitigation decisions are supported by detailed flood maps and real-time data. We partner with local communities to assist in the development and validation of flood inundation map libraries. Communities use these maps to help protect lives and property.

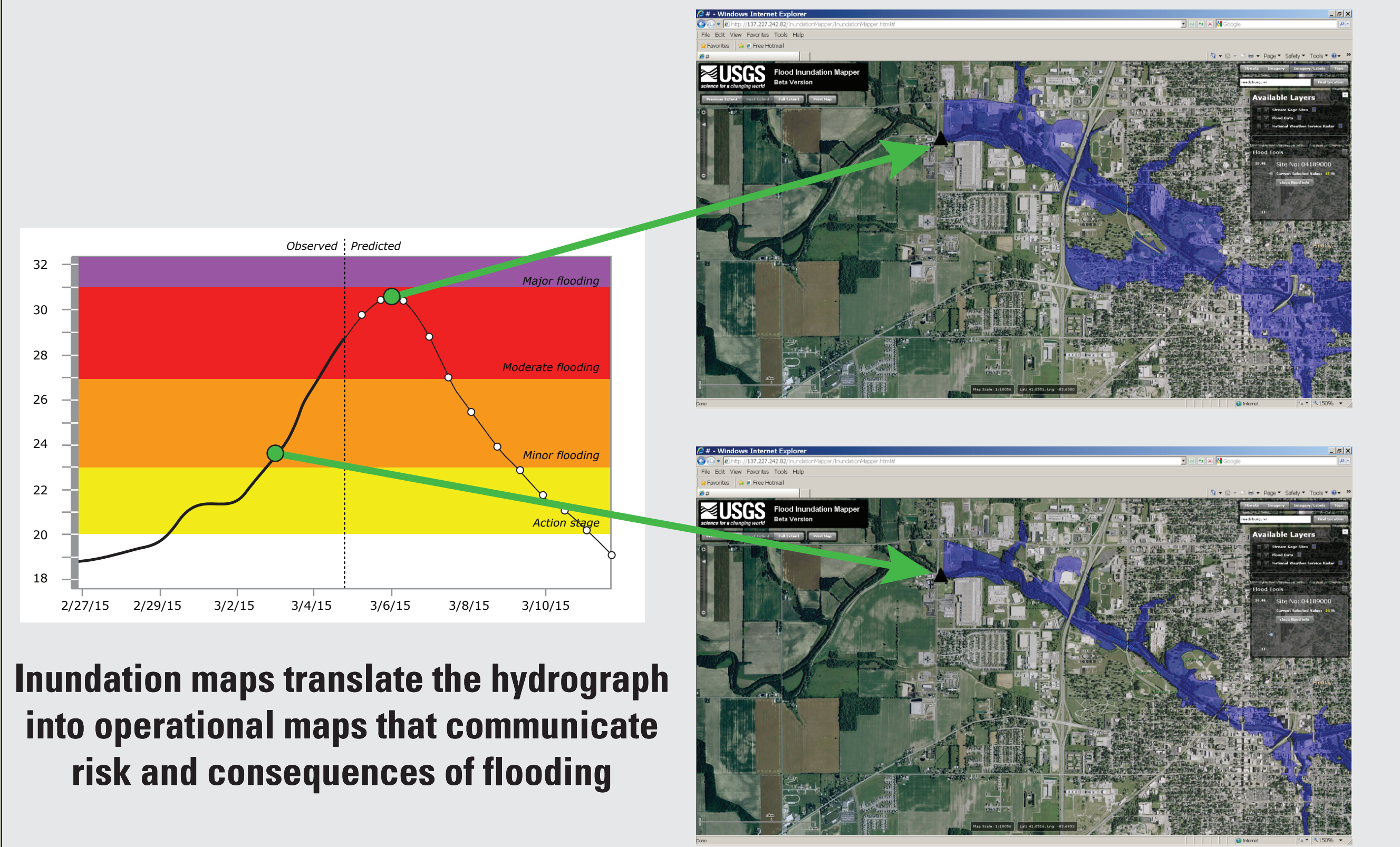
The USGS works with the National Weather Service, the U.S. Army Corps of Engineers, and the Federal Emergency Management Agency to connect communities with available resources and ensuring the quality and consistency of flood inundation maps across the country.

Inundation Maps can be used for:

- **Preparedness** - “What-if” scenarios
- **Response** - tied to real-time streamgage and forecasts
- **Recovery** - damage assessment verification focus
- **Mitigation and Planning** - flood risk analyses
- **Environmental & Ecological Assessments** - wetland and riparian habitat identification, hazardous spill cleanup



A flood inundation map library contains a series of sequential maps that help communicate where flooding may occur over a range of river levels.

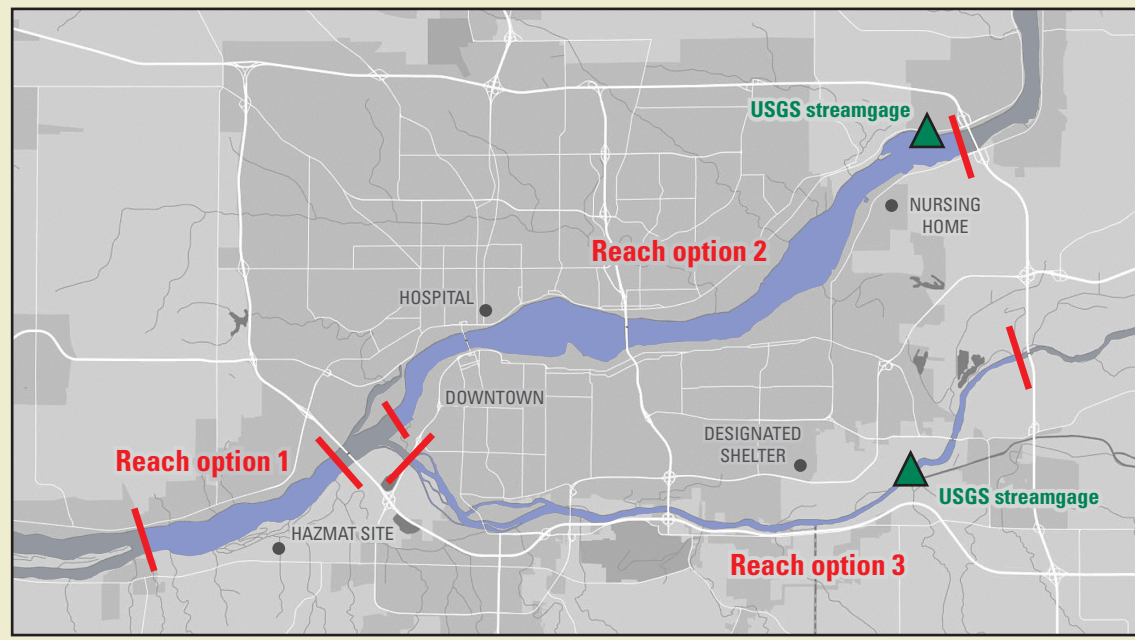


Inundation maps translate the hydrograph into operational maps that communicate risk and consequences of flooding

How do we make a Flood Inundation Map Library?

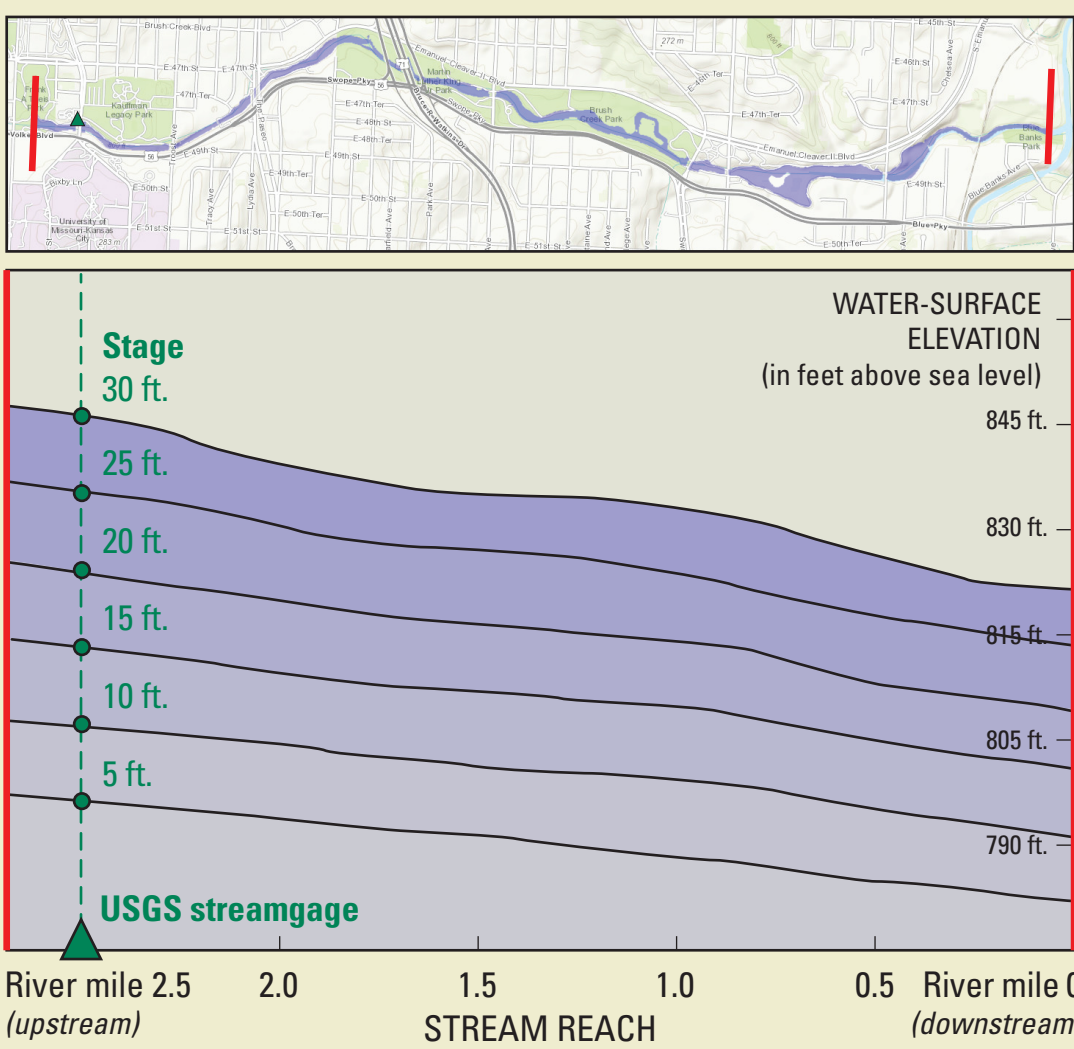
Step 1 - Stream selection

The mapping process is initiated by a local community that is interested in identifying its flood risk. The most appropriate stream or river reaches are near USGS streamgages located in a populated area. The National Weather Service (NWS) produces flood forecasts at about half of USGS-gaged streams. These stream reaches are preferred because they support both flood monitoring and response activities. In addition to the streamgage, topographic, bathymetric and structural data are needed.



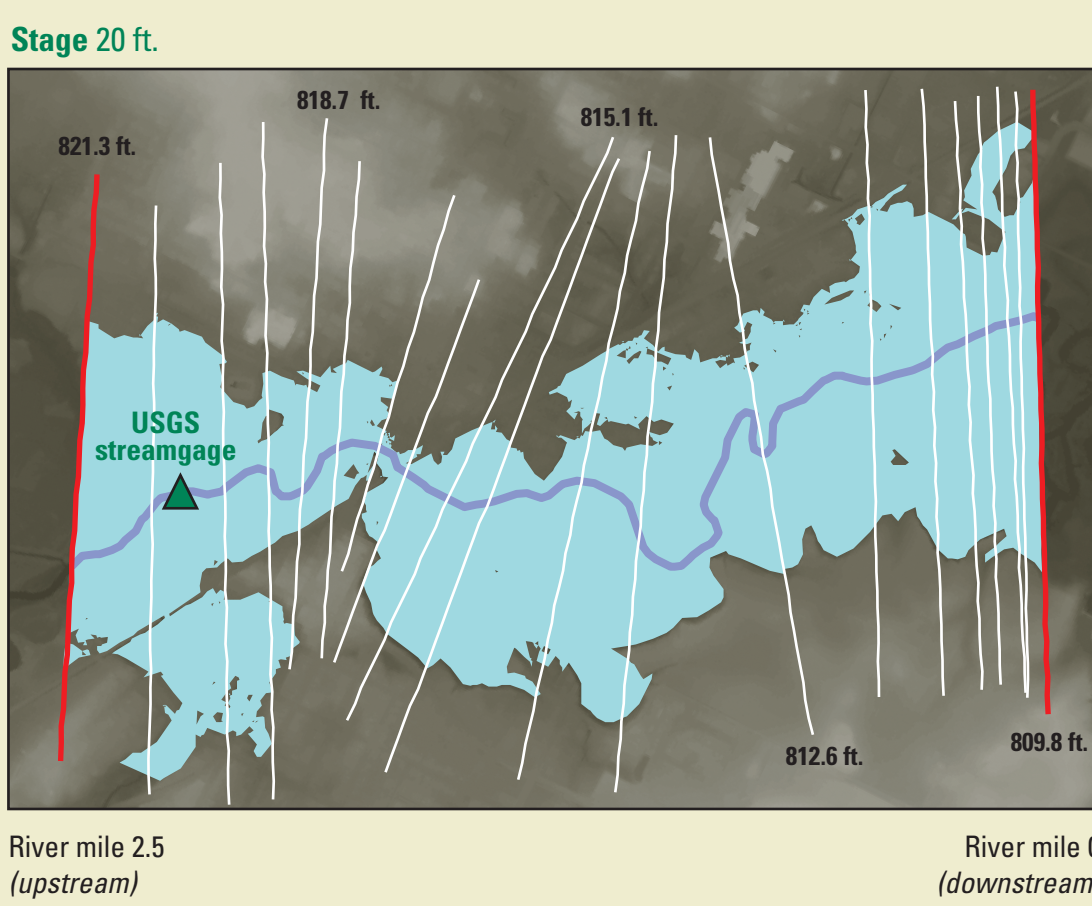
Step 2 - Model Flood Heights

A carefully calibrated hydraulic model is developed for the selected stream reach and is used to define the height of a flood along the reach at a selected river level. The model is run multiple times at incremental stream stages over the range of flooding conditions producing a series of water-surface profiles that define flood heights throughout the reach.



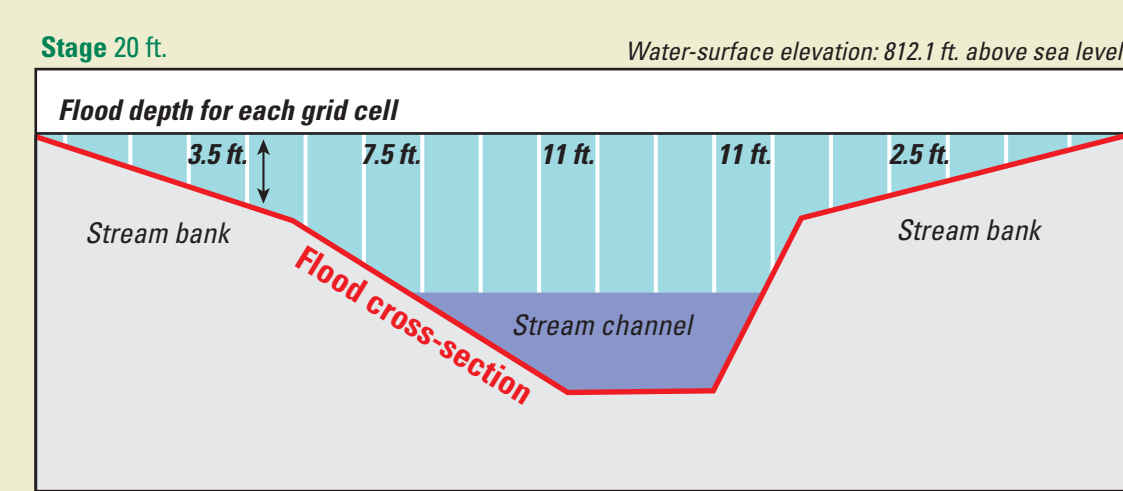
Step 3 - Delineate Flood Extents

After the hydraulic model identifies the incremental flooding heights, that data is combined with a very detailed ground-surface elevation model (typically a lidar-based Digital Elevation Model). This process creates a spatial grid showing where flooding would occur. These grids define the probable areas of floodwater inundation, and are the first pieces of a flood inundation map.



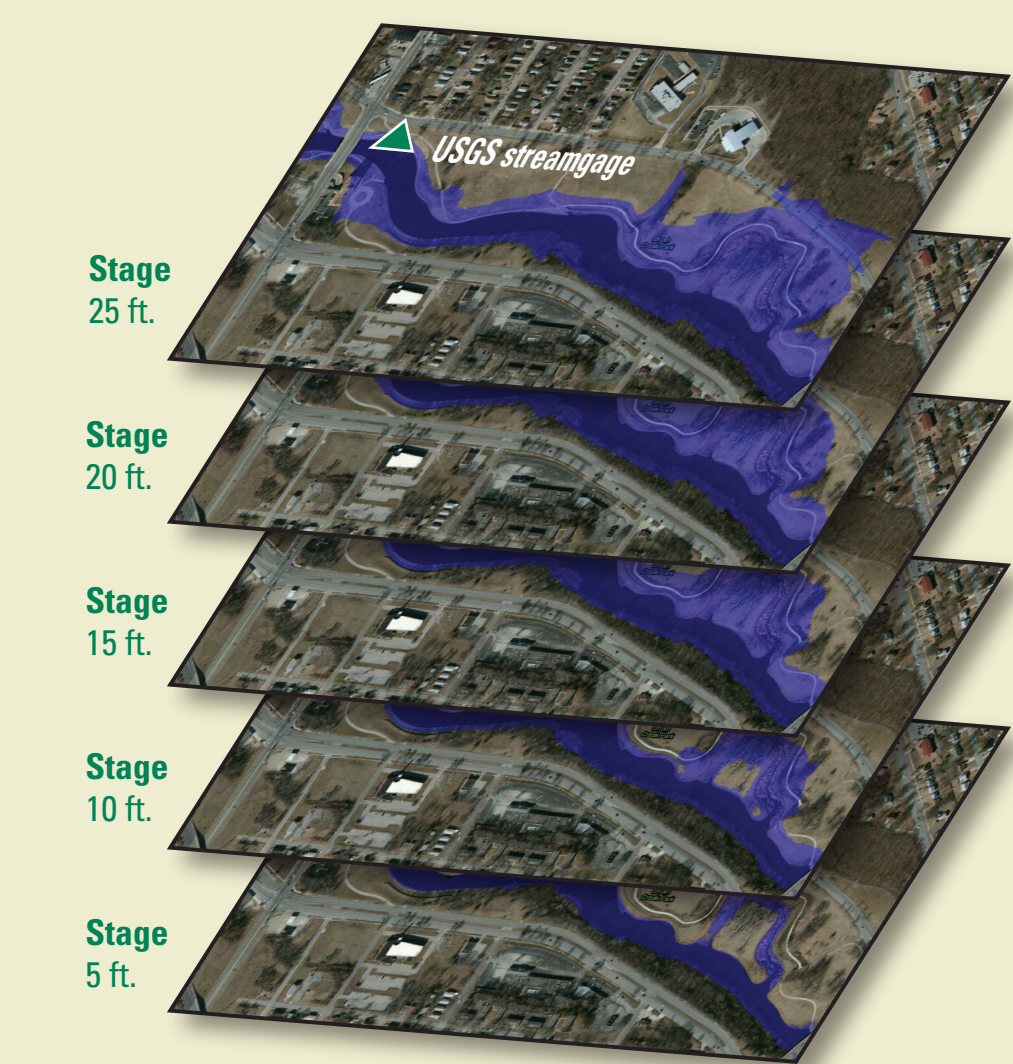
Step 4 - Compute Flood Depths

The next step is to model how deep the flooding would be for each grid cell in the inundation area. Once the depth grids have been determined, surface and inundation extents are calculated for all flood levels along the reach. Each extent represents a single flood inundation map, and provides a full picture of the flooding scenario - both how far and how deep the flood waters could reach.



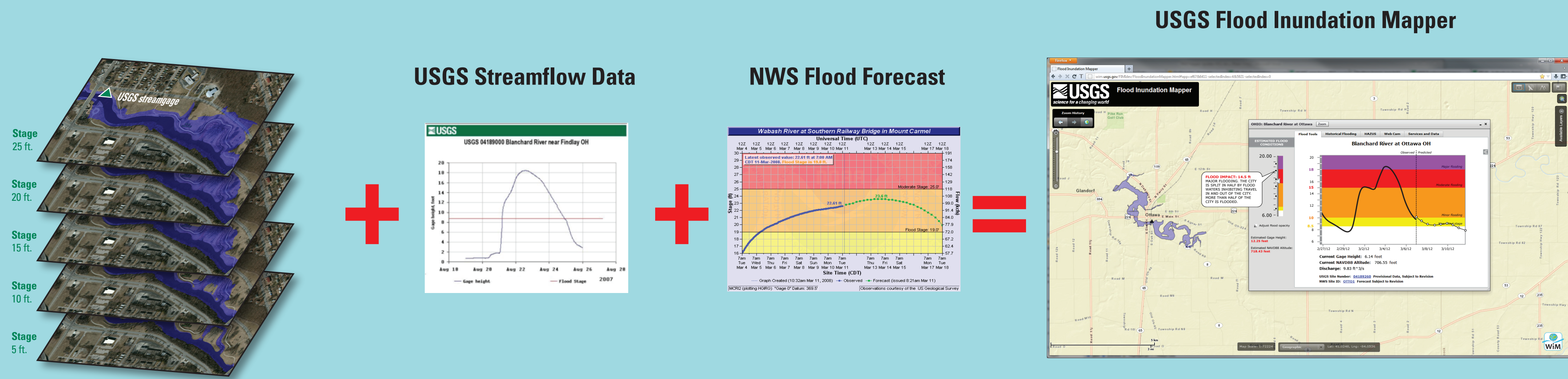
Step 5 - Process Map Library

The last step is to overlay the probable areas of floodwater inundation onto city maps, which helps communities visualize, plan, and respond to floods. A flood inundation map library is the full set of maps showing flood inundation from near-bankfull river levels to record flooding levels. Once the map library is reviewed and approved, it is published and uploaded to the USGS Flood Inundation Mapper where it can be seen and utilized by the public.



Bring it all together online:

The **USGS Flood Inundation Mapper** combines the flood inundation map libraries with real-time and historical USGS river-level data and National Weather Service flood forecasts into a powerful tool that helps communicate when and where it may flood and allows for better tools to inform local responses that can protect lives and property.



More Information about the Flood Inundation Mapping Program is available at:
http://water.usgs.gov/osw/flood_inundation

